

Foreword



National
Oceanic and
Atmospheric
Administration



U.S.
DEPARTMENT
OF
COMMERCE

NOAA Fisheries Service Northeast Cooperative Research Partners Program

The National Marine Fisheries Service (NOAA Fisheries Service), Northeast Cooperative Research Partners Program (NCRPP) was initiated in 1999. The goals of this program are to enhance the data upon which fishery management decisions are made as well as to improve communication and collaboration among commercial fishery participants, scientists and fishery managers. NOAA Fisheries Service works in close collaboration with the New England Fishery Management Council's Research Steering Committee to set research priorities to meet management information needs.

Fishery management is, by nature, a multiple year endeavor which requires a time series of fishery dependent and independent information. Additionally, there are needs for immediate short-term biological, oceanographic, social, economic and habitat information to help resolve fishery management issues. Thus, the program established two avenues to pursue cooperative research through longer and short-term projects. First, short-term research projects are funded annually through competitive contracts. Second, three longer-term collaborative research projects were developed. These projects include: 1) a pilot study fleet (fishery dependent data); 2) a pilot industry based survey (fishery independent data); and 3) groundfish tagging (stock structure, movements and mixing, and biological data).

First, a number of short-term research projects have been developed to work primarily on commercial fishing gear modifications, improve selectivity of catch on directed species, reduce bycatch, and study habitat reactions to mobile and fixed fishing gear.

Second, two cooperative research fleets have been established to collect detailed fishery dependent and independent information from commercial fishing vessels. The original concept, developed by the Canadians, referred to these as "sentinel fleets". In the New England groundfish setting it is more appropriate to consider two industry research fleets. A pilot industry-based survey fleet (fishery independent) and a pilot commercial study fleet (fishery dependent) have been developed.

Additionally, extensive tagging programs are being conducted on a number of groundfish species to collect information on migrations and movements of fish, identify localized or subregional stocks, and collect biological and demographic information on these species.

For further information on the Cooperative Research Partners Programs please contact:

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www.nero.noaa.gov/StateFedOff/coopresearch/

1.0 Project Summary

This project designed an electronic logbook and data reporting system for groundfish vessels. It is designed to meet the business needs of the fishermen as well as enabling them to fulfill the regulatory requirements for data reporting to NMFS for all permitted groundfish vessels. The electronic logbook software is designed for the desktop as opposed to the internet because it focuses on the fishermen's business requirements rather than regulatory requirements. It is not intended to be a form that the fishermen must fill out. It is intended to be a business tool. If the electronic logbook software is well written, the fishermen will view the generation of trip report data as just another program option.

Not only is the electronic logbook software designed for fishermen, it is designed by them. One of the principals on the project is an experienced lobsterman/fisherman. Twelve Windows-based laptop computers were purchased through this project then distributed, with the software, to a relatively diverse set of fishermen for their comments and suggestions. Even though the software will work on any Windows-based system, laptops were chosen due to their high degree of portability. The system could be easily moved from boat to home to office, etc. Windows was chosen as an operating environment due to its widespread popularity. Almost everyone has some familiarity with Windows. The electronic logbook software has also been incorporated into the Study Fleet Project as a possible component of their solution set. Comments received from the study fleet participants as well as their integration expertise have been invaluable to this project.

The electronic logbook software should reduce the burden on fishermen in meeting regulations by simplifying logbook reporting and reducing paperwork. It should reduce the burden on NMFS because previously handwritten, error-prone information will be in electronic format. This data would be checked for errors prior to input to the NMFS database. As a result, data entry, error-checking, as well as paper storage will be minimized if not eliminated. It should improve the timeliness and granularity of the data for scientific and policy analysis because of the reduced effort required for data submissions. The fishermen should also be able to improve their overall business operations, record keeping, and fishing activity management due to improved data storage, organization, and reporting capabilities.

2.0 Program Overview

The electronic logbook software targets the informational needs as well as the government reporting requirements of the commercial fisherman. The objective is to provide a package that assists the fisherman in managing fishing activity while organizing the data in a manner that satisfies government reporting requirements. The result should be more accurate and detailed data for both, the fisherman and the regulatory agencies. This must be achieved with minimal additional effort on the part of the fisherman.

The electronic logbook software is divided into two primary modules, the Logbook Manager and the Logbook. The Logbook Manager carries out tasks related to the management of the system as a whole. The individual functions are described in Section 2.3. The Logbook module targets those tasks that manage a specific trip. The Logbook's functions are described in Section 2.4.

2.1 The User Interface

The electronic logbook software employs the multiple document interface (MDI) as the application framework. The MDI consists of the MDI frame window and its MDI child windows. The MDI frame window supplies the command structure (menus and buttons), the application workspace, and window display management. The MDI child windows are comprised of the entry forms and reports that characterize the logbook application. The child windows are displayed within the application workspace. They can be resized, minimized, restored, and re-arranged. Additionally, the child windows can automatically be cascaded, tiled vertically, or tiled horizontally. The end result is that the program appears as a self-contained system that is separate from the operating system from the user's perspective.

2.2 Explanation of a Tow-Based System

Within the electronic logbook software, the tow is the foundation around which all program activities are built. The tow is designated as the primary unit of entry for catch and discard information. To ease data entry, catch values may be entered for the entire trip or for fish tickets to split among the tows. Discard values may also be entered for the entire trip to split among the tows. However, the only catch and discard reported is that which ends up under the entry for the tow. The intention here is to improve the granularity, and thereby the usefulness, of the data by promoting entry based on individual fishing efforts rather than encouraging the fishermen to enter trip totals or landed quantities.

Every tow created results in a new trip report. Each tow is restricted to having only one gear type and one management area. When new values for gear type or management area are required, the fisherman must create a new tow. Within the electronic logbook software, the user must pre-define gear types. The gear type combines the NMFS gear code, the mesh/ring size of the gear, and the size of gear data fields into one entity. The fisherman then must select one, and only one, gear type per tow. This has the net result of producing a new tow and, consequently, a new trip report every time the gear fished, the mesh/ring size of the gear, or the size of the gear changes.

Outside of these gear and management area constraints, it is left to the fisherman to determine the organization of the tows. A new tow can be created for each haul (or trip effort). Several hauls can be grouped into a single tow. All hauls can be grouped into one tow. There is an obvious trade-off. As more tows are created, the value of the data is enhanced but the entry of the data is more time-consuming. As long as the same gear is used and the same management area is fished, the fisherman can arrange tows in whatever manner is most favorable to the circumstances surrounding each trip.

2.3 The Logbook Manager

The Logbook Manager carries out tasks related to the management of the system as a whole as opposed to the Logbook program which targets those tasks that manage a specific trip. The Logbook Manager consists of the following modules:

- User Security
- Backup / Restore
- File Export / Import
- Operator / Crew Setup
- Vessel Maintenance
- Gear Maintenance
- Trip Defaults Setup
- Species Code Maintenance
- Management Area Maintenance
- Species Quota Management

Species Entry Limit Management
Dealer and Dealer Product Maintenance

In addition, the Logbook Manager offers the following reports:

Species Summary
Species Detail
Trip Reports

The “User Security” menu option supplies the mechanism for defining user security. For this package, user security is applied at the task level. Basically, a user is either allowed access or not allowed access to a menu item or command button. Within this option, the fisherman adds user records and allows or rejects access to tasks for that user. The “system” user (username “system”, password “system”) is delivered with the software. It is suggested that a new user is immediately added to the system and the “system” user is subsequently deleted. At the very least, the “system” user’s password should be altered.

Options are provided for system backup, system restore, file export, and file import. The backup option creates a copy of the database that can be subsequently restored in case of system failure. The import and export routines allow the fishermen to send or receive data via a comma-delimited file format. The result is a data file that can be transferred utilizing any method typically used to transmit files (floppy disk, phone line, e-mail, etc.). This is the current method of data interchange utilized within the electronic logbook software.

The Logbook Manager is where setup data is entered. Operators and crew members are defined in the “Operator / Crew Setup” option. The “Vessel Maintenance” option supplies the mechanism for defining fishing vessels. The fisherman can define as many vessels as needed. Most of the data fields are informational. However, a value for vessel permit number, USCG permit number, or state registration number is required. The “Gear Maintenance” option

Operator and Crew Maintenance

Operator's Name: John Smith

Last Name: Smith

First Name: John

Permit #: 10003631

Crew Member's Name:

Last Name:

First Name:

Permit #:

Buttons: Add Oper, Delete Oper, Save, Cancel, Add Crew, Delete Crew, Save, Cancel, Exit, Help

institutes pre-defined gear types. These types group the gear code, size of gear, and mesh/ring size data fields into a single entity. For each gear type, the fisherman can define species that are typically caught, species that

are typically discarded, and default values implemented when creating a tow. The “Trip Defaults Setup” option assigns trip defaults to a vessel. These defaults include the operator, gear type, crew/angler count, port of departure, and trip type data fields and are implemented during trip creation.

The “Species Code Maintenance” option allows the fisherman to tailor species codes according to preference.

The fisherman can remove species codes in order to make it easier to navigate through codes during the selection process. The fisherman can also add species codes although this would not be recommended without permission since problems would be encountered during receipt of the vessel trip report. However, this does provide a mechanism to add new government-defined codes. Also, the fisherman can redefine

Species Code	Description of Species
ALB	Albacore
ALWF	Alewife
BBR	Black Bellied Rosefish
BET	Big Eye
BFT	Bluefin
BLU	Bluefish
BON	Bonito
BSB	Black Sea Bass
BUM	Marlin, Blue
BUT	Butterfish
CAT	Woolfish / Ocean Catfish
CLA	Clam, Arctic Surf
CLNS	Clam, Species Not Specified

Species Code: ALB
Description of Species: Albacore
Species Category: Tunas

categories. This may come in handy during the selection process. For example, the fisherman may define a category called “Typical Catch” and place all species that are typically caught into this category.

One of the intended features for the electronic logbook software was to ensure user-entered location values fell within the boundaries of the corresponding management area. The “Management Area Maintenance” option allows the fisherman to input boundaries for each chart area. Ideally, the boundary values could be automatically imported into the system. When the fisherman enters a location value during tow definition, that value would be checked against the boundaries for the entered chart area to guarantee that the location was indeed situated within that area.

Chart Area	Description of Area

Point 1: Point 2:

The fisherman can define quota limits for species with the “Species Quota Management” option. When the total trip catch for a species exceeds this value, a warning message is issued. The fisherman can set a value for

an entry limit for each species with the “Species Entry Limit Management” option. This value represents the largest possible single entry for that species. Any entry greater than this value will result in a warning message.

The “Dealer and Dealer Product Maintenance” option allows the fisherman to define dealers and to cross-reference dealer product codes to NMFS species codes. The dealer codes are utilized in the “Add Dealer Info to VTR” option within the Logbook module. The fisherman simply adds a dealer to the entire trip, to the entire tow, or to an individual catch record by choosing it from a list. There are pre-defined dealer values for product seized for violations, product used for bait, transferred product, product identified for future sale, and product used for home consumption. When one of these conditions take place, the fisherman selects the appropriate value as a substitute for the dealer. Dealers often use internal product codes that do not have any relation to the NMFS species codes for referencing their product. This can create problems in comparing landed quantities to tow estimates. This section allows the fisherman to define dealer product and cross-reference the dealer product code to the NMFS species code.

Within the Logbook Manager, the fisherman can issue a species summary report, a species detail report, and trip reports. Each of these reports requires a date range to be entered (see attached figure). The species summary report lists the total amount of each species caught in a given timeframe. The species detail report also lists the total amount of each species caught in a given timeframe. However, the species detail report also lists the amount of each species caught in each tow. The trip report allows the fisherman to preview all trip reports for a given timeframe.



Select a Date Range

Start Date 12/ 1/2003

End Date 12/31/2003

OK Cancel

2.4 The Logbook Program

The Logbook program targets those tasks that manage a specific trip. The Logbook consists of the following modules:

- Trip Manager

- Tow Manager

- Tow Samples

- Catch and Discard Entry

- Add Dealer Info to VTR

Fish Ticket Entry

Trip Catch Entry

Catch Splitter Utility

Trip Expense Maintenance

Landing Maintenance

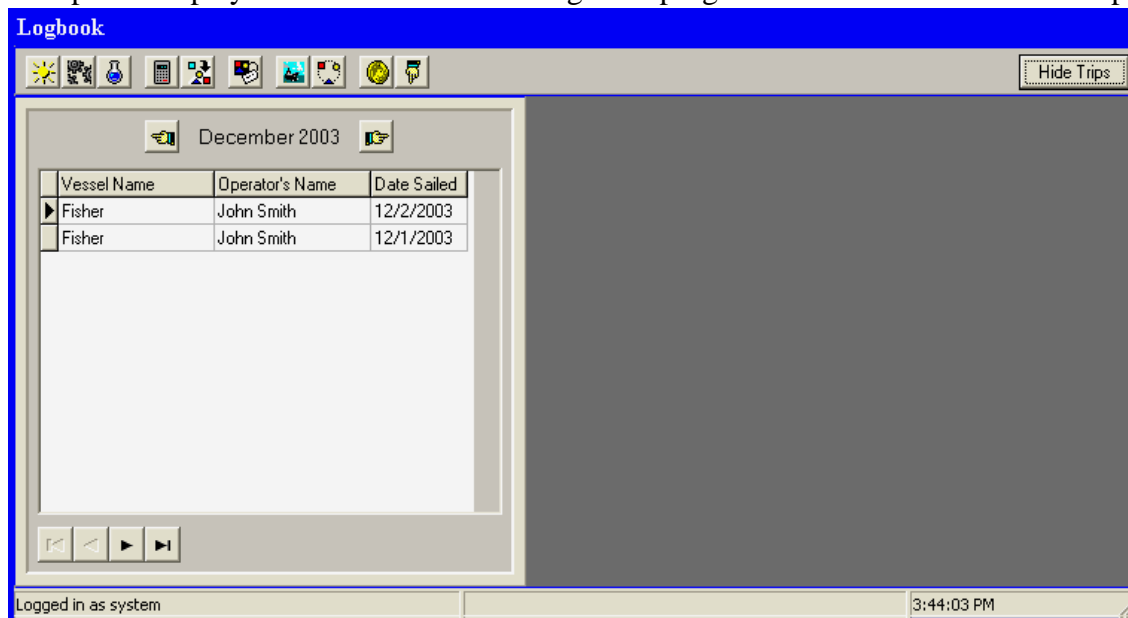
In addition, the Logbook module offers the following reports:

Trip Catch

Trip Discard

Trip Landed Quantity

The panel displayed on the left of the Logbook program's screen is called the Trip Selector. The trips are



displayed in reverse order of the date sailed (with the most recent trip being displayed at the top). Navigating through this grid selects the current working trip. All other forms displayed within this program utilize the

current trip. To remove the Trip Selector from the screen, click the "Hide Trips" button. The caption on the button will change to "Show Trips". Click the "Show Trips" button to display the Trip Selector once again.

The "Filters" menu provides options that allow the fisherman to display only those trips that match certain criteria. Trips that do not match the criteria are not displayed, or filtered out. Filtering is a valuable option when the fisherman wants to limit those trips that are displayed to those applicable to the tasks at hand. There are three filters to display trips at the various stages of data transfer. The "to Create" option displays only those trips that have not had files created for data transfer. Filtering by the "to Transfer" option displays only those

trips that have not had its files transferred. The “to Verify” filter displays the trips that have not been verified. Click “View All” to turn off the current filter and display all trips. The selection to filter “by Month” displays only those trips that begin in a particular month. Click the left arrow to display the trips that begin in the previous month. Click the right arrow to display the trips that begin in the next month.

The “Trip Manager” option allows the fisherman to enter trip parameters. The trip defaults, for a vessel,

Trip Maintenance

New Trip Delete Trip Save Cancel

Vessel: Fisher Operator: John Smith Trip Notes:

Sailing Id:

Departure Date and Time: 7/15/2003 6:00:00 AM

Port of Departure (city and state): Manchester MA

Trip Type: ☒ Commercial ☐ Party ☐ Charter

of Crew Members: 2 # of Anglers: (excluding crew)

Return Date and Time: 7/15/2003 8:00:00 PM

Exit Help

defined in the Logbook Manager Module are utilized here. When a vessel is selected, defaults defined for the operator, port of departure, trip type, number of crew members, and number of anglers are automatically inserted. Departure date and time as well as return date and time default to the current date and time. Utilizing effective defaults often results in the fisherman only entering a sailing identifier and adjusting the return time. Also notice the notes entry

area. Any notes specific to the trip can be entered.

The heart of this program is the “Catch and Discard Entry” option. This option maintains tow, catch, and discard information. When a tow is created, the default gear type assigned to the vessel in the Logbook Manager is selected. The fisherman can change this selection. When the gear type is selected, each of the typical catch and discard species assigned to that gear type within the Logbook Manager is copied to the catch or discard record of the tow. For these codes, the fisherman only needs to enter

Tow Estimates

New Tow Delete Tow Save Cancel Tow Set Tow Up

#	Start Date	Start Time	End Time	Chart Area
1	12/2/2003	8:00:00 AM	12:00:00 PM	514
2	12/2/2003	3:34:00 PM	3:34:00 PM	513

Gear Used: Main Gill Net

Start Date: 12/2/2003 Start Time: 8:00:00 AM

End Date: 12/2/2003 End Time: 12:00:00 PM

Chart Area: 514

Start Location 1: 13855.2 Start Location 2: 25401.1

End Location 1: 13855.2 End Location 2: 25401.1

of Hauls: 1 Qty of Gear: 3 Average Depth (fathoms): 20

Average Speed (knots): 13 Average Tow/Soak Time: 3 Hours 30 Minutes

Notes:

Tow Estimate:

Code	Description of Species	Est. Qty.
COD	Cod	75
HADD	Haddock	200

Tow Discard:

Code	Description of Species	Discard Amt.
COD	Cod	25
WHAK	Hake, White	50

Exit Help

quantities. If other species are caught or discarded, they can simply be added to the list. The defaults assigned

to the gear type for chart area, number of hauls, quantity of gear, average depth, average speed, and average tow/soak time are copied to the corresponding fields for the tow. The start and end date and times default to the current date and time. The “Tow Set” button will automatically place the current date and time in the tow start date and time fields as well as place the current location in the start location field as read from a GPS. The “Tow Up” button does the same for tow end date and time as well as the end location. The “Tow Manager” option manages just the tow portion. Also, the “Tow Samples” option allows the fisherman to obtain sample information at intervals within the tow.

In many instances, the fish ticket is the best source of the catch quantities submitted in the vessel trip report (i.e. a lobster boat). There are other times where problems occur at sea and maintaining catch quantities for each tow is not possible and an estimate for the entire trip must be made. The fisherman might want to compare estimated tow quantities with landed quantities to verify the estimation methodology. The “Fish Ticket Entry”,

Product Code	Product Description	Species Code	Landed Qty.	Uom	Unit Price	Extended Price
100	Market Cod	COD	50	LBS	\$1.92	\$96.00
101	Scrod	COD	25	LBS	\$1.56	\$39.00
150	Haddock	HADD	200	LBS	\$1.88	\$376.00
200	Lobster	LOB	200	LBS	\$3.84	\$768.00

“Trip Catch Entry”, and “Catch Splitter Utility” options can be utilized to handle these as well as other situations.

Fish tickets maintain a record of each sales transaction. This is, in of itself, a good reason to supply the “Fish Ticket Entry” option. In addition to providing the fisherman with a means to maintain a record of each sales transaction, this option offers an alternative method to entering catch quantities. The fisherman enters

the fish ticket as supplied by the dealer and adds the NMFS species code to each product line item. Note that the species code and product description only has to be entered the first time a product code is called out. Subsequent product code entries will automatically display the corresponding description and species code. Once entry is complete, the landed quantities can be used as the total catch quantity and subsequently split among the tows.

Use the “Trip Catch Entry” option to enter a catch total for the entire trip which, later, can be split into tows. Complete entry of total catch for each species (including dealer permit and date sold) will allow the fisherman

to split this catch among tows either in proportion to the estimates or evenly. Click the “Use Fish Tickets” button to automatically import fish ticket information. Click the “Use Estimates” button to use the values entered for estimates in the actual catch. Once a total has been entered for the trip, that value can be split among the tows, either in proportion to the estimates entered or an equal split, by using the “Catch Splitter Utility” option.

Code	Description of Species	Amt. Caught	Dealer Permit	Dealer Name	Date Sold
COD	Cod	75	20000	Gloucester Seafood	12/2/2003
HADD	Haddock	200	20000	Gloucester Seafood	12/2/2003
LOB	Lobster	200	20000	Gloucester Seafood	12/2/2003

Species Code: LOB Description: Lobster
Amount Caught: 200 Dealer Identifier: Gloucester Seafood
Dealer Permit: 20000 Date Sold: 12/2/2003

The “Add Dealer Info to VTR” option is another utility that simplifies the task of assigning catch quantities to a dealer. It provides a function to pick a dealer from a list and add that dealer to the catch quantity record. It also provides a utility to add a dealer to all catch records in the tow. This can save considerable key entry time.

The “Trip Expense Maintenance” option allows the fisherman to itemize the expenses for the currently selected trip. These expenses can be displayed for each trip in the report section of the Logbook. The expenses can be totaled for a given time period in the report section of the Logbook Manager. Trip landings can be maintained with the “Landing Maintenance” option. This information is required for the Vessel Trip Report.

Description of Trip Cost	Cost
Bait	\$50.00
Crew	\$200.00
Gas	\$100.00
Unloading Fee	\$38.76

The reports in the Logbook program are provided for the current trip selected (in the trip selector panel). There is the “Catch Report” which lists the total estimated catch of each species for the trip. This report can be displayed in summary form or in detail (catch is broken out by tow). The “Discard Report” lists the total estimated discard of each species for the trip. This report can also be shown in summary or detail form. The “Quantity Landed Report” lists the landed quantity, as entered in the fish tickets, of each species for the trip.

3.0 Design Considerations

The electronic logbook software targets the requirements of the independent fisherman. Ease of use and simplicity of design were the core criteria for all decisions related to the development of the product. The resulting system could not be costly to implement or maintain. Confidential financial data would have to be maintained within the software implying that the fisherman should have complete control over access to this information. This led to the choice of the PC/Windows application environment as a development and implementation platform. This is an environment that is familiar to almost everybody. Therefore, it is relatively straightforward to use. By definition, all operations pertaining to a personal computer can be exclusively controlled by the owner. Finally, both, the operating system and the hardware, are commodity items that are reasonably inexpensive to purchase and maintain.

Even though the electronic logbook software will work on any Windows-based system, laptops were chosen due to their high degree of portability. The system could be easily moved from boat to home to office, etc. This was very important during the testing phase of the software. The fisherman could try out the software on the boat or at home. When problems occurred or updates were delivered, it was easy to access the system. In actual practice, the software would probably be installed on the on-board computer. This would allow the fisherman to take advantage of the connections to the GPS and thermal sensor hardware. In addition, this would promote at-sea data entry of catch and discard estimates.

The electronic logbook software was developed with Borland C++ and utilized the Database Desktop for data management. Again, ease of use and cost considerations were the main criteria in this choice. The Database Desktop is a deliverable product. This means that the fisherman does not have to worry about purchasing and maintaining a database product separate from the application.

One of the primary development concerns was in discovering ways to minimize key entry. The fisherman is more likely to use the software if the amount of typing is reduced. Not only is the use of the system more likely, but more detailed and accurate data should result. As an example, instead of combining several hauls (or trip efforts) into a single tow, the fisherman is more likely to break out hauls into separate tows if the effort to do so is minimal. This increases the granularity and accuracy of the data. Which, in turn, increases its value. Three methods of minimizing key entry discussed below are the utilization of defaults, the setting up of typical catch/discard species, and the use of selector lists.

Defaults are heavily utilized within the electronic logbook software. A default is a pre-defined entity that represents the most likely value to be used in practice. Trip defaults are set up for each vessel. When a new trip is created and a vessel is chosen, the default values are automatically used for the operator, gear type, crew count, port of departure, and trip type data fields. Often, the user just has to enter a sailing identifier and adjust the value for ending time of the trip. Similarly, tow defaults are set up for each gear type. When a new tow is created, the default values corresponding to the selected gear type are automatically used for chart area, number of hauls, quantity of gear, average depth, average speed, and average tow/soak time data fields. It is not mandatory to set up default values. However, it can save a great deal of time in entering data for a trip.

Vessel Trip Defaults

Vessel Name: Fisher

Default Operator: John Smith

Default Gear Type: Main Gill Net

Default Crew Count: 2

Home Port: Manchester

Home State: MA

Default Trip Type: ☒ Commercial ☐ Party ☐ Charter

Exit Help

An extension of defaults is the concept of assigning typical catch and discard species codes to each gear type. When a new tow is created and a gear type is chosen, the species codes are recorded in the catch and discard record for that tow. The user then just has to enter the quantities.

Selector lists occur throughout the program. A selector list displays a list of possible values to choose from. The user then clicks a button (typically labeled select) and the value is automatically utilized. Selector lists are available for species codes, gear codes, trips, etc. In addition, species and gear codes are categorized while trips can be filtered by month. This makes it easier to navigate through the list of values.

Species selection for fish catch

Select

Species Code	Description of Species
FLBB	Winter / Blackback
FLDAB	American Plaice / DAB
FLFSP	Fourspot
FLGS	Witch / Gray Sole
FLSD	Sand-dab / Windowpane / Brill
FLUKE	Summer / Fluke
FLYT	Yellowtail
HAL	Halibut, Atlantic
HALG	Halibut, Greenland

Exit Help

There were several major design issues that were addressed within the electronic logbook software. First, multiple users may need to access the system but not all users should have access to all areas of the system. Second, forcing (or allowing) the user to pre-define gear types will provide significant benefit in reducing key entry and species code lookup while entering tow information. Third, one of the more common errors identified during the submission of vessel trip reports was in the values submitted for fishing location. Utilizing this software should reduce the number of these errors. Fourth, dealers use their own

product identifier which does not necessarily contain the NMFS species code. This creates problems when attempting to reconcile landed quantities with estimates. Finally, there are many different methods a fisherman uses to report catch and discard quantities. This software attempts to provide the flexibility, while maintaining data integrity, to ease data entry regardless of when or how the fisherman reports catch values. The following sections (while providing an opportunity to display some of the software’s capabilities) discuss these design issues in more detail.

3.1 User Security

Much of the information stored within this system is confidential in nature. However, in some instances, multiple users may need access to certain parts of the system. They should not be able to access all areas. An example of this is one of the fishermen testing the software wanted his crew to enter catch and discard information while on the trip. However, the crew should not have access to fish ticket or trip expense information. A security feature was added where menu items can be blocked with regard to the user. This, effectively, does not allow certain users into sensitive areas.

The “User Security” form (see attached figure) supplies the mechanism for defining user security. For this package, user security is applied at the task level. Basically, a user is either allowed or not allowed access to a menu item or command button. All program users are listed, by user name, in the grid at the top of the form. As the user names are navigated, the matching security specifications are displayed. The fisherman can then edit these specifications, add new users, and delete users. To edit a specification, simply click the checkbox to turn the command on or off. If a check is displayed, the user has access to that task. The “system” user (username “system”, password “system”) is delivered with the software. It is suggested that a new user is immediately added to the system and the “system” user is subsequently deleted.

The screenshot shows the 'User Security' window. At the top, there's a title bar and a set of navigation buttons (back, forward, etc.). Below that are 'Add User', 'Delete User', 'Save', and 'Cancel' buttons. The main area is divided into several sections. On the left, there's a 'UserName' list box with 'system' selected. To the right of this are input fields for 'Password' and 'Confirm'. Below these are three main sections, each with a title and a list of checkboxes. The first section is 'Logbook Manager' with checkboxes for 'User security', 'Backup / restore', 'File import / export', and 'Archive / retrieve'. The second section is 'Manager maintenance' with checkboxes for 'Operator / crew entry', 'Vessel / trip defaults entry', 'Gear maintenance', 'Dealer maintenance', 'Species code maintenance', 'Area maintenance', 'Permits / quotas entry', and 'Entry limits maintenance'. The third section is 'Logbook' with checkboxes for 'Tow / tow sample entry', 'Catch / discard entry', 'Fish ticket entry', and 'Trip reports'. At the bottom right, there are 'Exit' and 'Help' buttons.

When either the Logbook or the Logbook Manager is started, all options except for File | Login are unavailable to the user. The user must login. Once login is successful, options become available based on the associated privileges that were defined in the user security section. After 3 unsuccessful attempts, the program exits in order to discourage outside users from accessing the system.

3.2 Gear Definition

Catch and discard quantities must be reported for each type of gear fished and for each mesh / ring size utilized.

A change to either of these data values should result in the creation of a new vessel trip report. This software enforces this requirement by compelling the user to predefine gear types. The gear type combines the NMFS gear code, the mesh/ring size of the gear, and the size of gear data fields into one entity. The fisherman then must select one, and only one, gear

Create Gear Types

Buttons: Add Gear, Delete Gear, Save, Cancel

Description of Gear

- Main Gill Net
- Lobster Pots

Gear Code

- DRC Dredge, Ocean Quahog / Surf Clam
- DRM Dredge, Mussel
- DRS Dredge, Scallop
- GND Gill Net, Drift, Large Mesh (tuna)
- GNR Gill Net, Runaround
- GNS Gill Net, Sink (groundfish)
- GNT Gill Net, Drift, Small Mesh (herring)
- HND Hand Line / Rod & Reel

Description:

Main Gill Net

Gear Code: GNS Size of Gear: 50 Mesh / Ring Size: 50

Mesh Type: ☒ Square ☐ Diamond

Default Area: 514 Default Depth: 20 Default Speed: 13

Default Haul Count: Default Qty of Gear:

Default Tow/Soak Time: 3 Hours 30 Minutes

Target Catch:

Code	Description of Species
CAT	Wolfish / Ocean Catfish
COD	Cod
CUSK	Cusk
HADD	Haddock
MONK	Monkfish / Anglerfish / Goosefish
WHAK	Hake, White

Species Code

- ALB Albacore
- ALWF Alewife
- BBR Black Bellied Rosefish
- BET Big Eye
- BFT Bluefin
- BLU Bluefish

Typical Discard:

Code	Description of Species
CAT	Wolfish / Ocean Catfish
COD	Cod
CUSK	Cusk
HADD	Haddock
MONK	Monkfish / Anglerfish / Goosefish
WHAK	Hake, White

Buttons: Exit, Help

type per tow. By tying one gear type to a tow and making the tow the reference point for the trip report, any gear change will result in a new trip report. Gear types are managed with the “Create Gear Types” form (see attached figure).

Predefined gear types have resulted in a significant reduction in the amount of data that must be key-entered for all of our users. Instead of entering a gear code, a size of gear value, and a value for mesh / ring size for each tow, the fisherman just selects a gear type from a list. Default values can be entered for chart area, average depth, average speed, haul count, quantity of gear, and average soak time. These default values are copied into

the corresponding fields for the tow on gear selection. Effective default values results in minimal key entry when creating a new tow.

For each gear type, the fisherman can define species that are typically caught as well as those that are typically discarded. When the gear type is chosen for a specific tow, the species codes from the typical catch records of the gear are copied to the tow's catch file. The species codes from the typical discard records are copied to the tow's discard file. In most cases, all the fisherman has to do is enter catch/discard quantities. The time-consuming task of looking up species codes is virtually eliminated.

3.3 Management Areas and Location Entries

One of the most common errors which occur in vessel trip reporting is in the entry of location information. This program supplies a GPS interface that allows the fisherman to obtain positional data at the start and end of the tow with the click of a button. This will guarantee accurate location data. However, there may be times when the fisherman has to key enter the locations for the start and end of the tow. The "Management Area Boundaries" form (see attached) allows the fisherman to input boundaries for each chart area. Ideally, the boundary values would be automatically imported into the system. When the user enters a location value during tow definition, that value would be checked against the boundaries for the entered chart area to ensure that the location was indeed situated within that area. This does not guarantee that the location value was accurate. It just guarantees that the user-entered values for chart area and location coincide.

The screenshot shows a software window titled "Management Area Boundaries". It features a menu bar with buttons for "Add Area", "Delete Area", "Save Area", and "Cancel". Below the menu bar is a table with two columns: "Chart Area" and "Description of Area". The "Chart Area" column has a dropdown arrow. To the right of the table is a map area with a dropdown arrow and a "Point 1" label. Below the map area are two input fields labeled "Chart Area" and "Description of Area". At the bottom right are "Exit" and "Help" buttons.

3.4 Dealer Product Codes

Dealers often use internal product codes for referencing their product. Dealers require their own product codes to reflect differences within a species. As an example, a dealer might have different prices for large cod, market cod, and scrod. This requires three different product codes for the same species. For trip reporting purposes, it is all just COD.

The software resolves this issue by allowing the fisherman to cross-reference the dealer product code to the species code. These products can be pre-defined in the logbook manager. Using the above example, the fisherman can enter product 100 for large cod with a species code value of “COD”, 101 for market cod with a species code of “COD”, and 102 for scrod with a species code value of “COD”. When the system utilizes fish tickets during catch entry, all three items will be considered COD for reporting purposes. Alternatively, the product can be entered on the fish ticket. Any new product entered will be saved for future reference.

The screenshot displays the 'Dealer Maintenance' window, which is divided into two main sections: 'Dealer Information' and 'Product Information'.

Dealer Information Section:

- Buttons:** New Dealer, Delete, Save, Cancel.
- Table:**

Id #	Name
00001	Seized for violations
00002	Sold/retained for bait
00003	IWP/JV transfer
00004	Future sale
20000	Gloucester Seafood
99998	Used for home consumption
- Form Fields:**
 - Dealer Permit #: 20000
 - Dealer Name: Gloucester Seafood
 - Address: 100 Rogers Street
 - City: Gloucester, State: MA, Zip: 01930
 - Phone Number: (978) 283-0123

Product Information Section:

- Buttons:** New Product, Delete, Save, Cancel.
- Table:**

Product Id	Description of Product
100	Market Cod
101	Scrod
150	Haddock
200	Lobster
- Form Fields:**
 - Product Id #: 100
 - Description: Market Cod
 - Species Code: COD

At the bottom right, there are 'Exit' and 'Help' buttons.

In order to reconcile the landed quantity with the aggregate estimated quantity caught in the tows, the species code must be listed somehow in the fish ticket. The software resolves this issue by allowing the fisherman to cross-reference the dealer product code to the species code right on the fish ticket. The fisherman can import or key enter the fish ticket. The species code can then be key-entered for each product line item. The product information with the attached NMFS species code will be saved. Subsequent dealer / dealer product entries will supply description and species code information automatically.

In actual practice, the fish ticket should be transferred from the dealer to the fisherman and automatically imported into the system. However, this does not resolve the species code / dealer product code conflict. The best way to resolve this conflict from an efficiency point of view would be to have the dealer cross reference the product code to the species code. This would resolve the conflict at the source of the information. However, the dealer is the most removed participant in terms of requiring or supplying this information. Basically, why should the dealer add a step to its process when there is no benefit? It is probably best that the fisherman performs the cross reference. The fisherman requires the fish ticket data for accounting purposes and has the requirement of providing the government with an accurate catch by species.

3.5 Providing Flexibility in Entering Catch Information

There are many different methods a fisherman uses to report catch and discard quantities. Some fill out the report during the trip. Some fill out the report right after the trip, perhaps when fish ticket information is received. Others wait until the end of the month and do all of the trip reporting at once. Some fishermen enter the information off of fish tickets while others use the quantities estimated during the trip. Some fishermen enter totals for the entire trip while others want to maintain catch quantities for every haul. The electronic logbook software promotes entry of estimates by tow. With that said, however, this project does not make any judgments as to what is the best (or most correct) way to enter this information and acknowledges that there are times when it is impossible to enter estimates on a tow basis. This project has taken the stance that the fisherman should (and will) do what is best based on the given set of circumstances. Of course, the finer the granularity of the information, the more accurate and useful the information becomes. A primary goal of this project was to provide the flexibility to ease data entry, while maintaining data integrity, regardless of when or how the fisherman reports catch values.

With the electronic logbook software, the user can enter estimates by tow, enter a trip total by utilizing fish ticket data, and enter a catch total for the entire trip. Routines are provided that allow the estimates to be used for the total trip catch, allow the catch for the entire trip to be split in proportion to the estimates, allow the catch for the entire trip to be split evenly among the tows, and allow the fish ticket quantities to be transferred to the catch quantities for the entire trip (these quantities can, subsequently, be split into tows).

A large amount of time was spent considering the fish ticket entry option. This project maintains that this is valuable information that the fisherman should at least have the option to maintain since it contains a record of sales transactions. The problem has come with the reconciliation of the fish ticket information to the catch estimates. At one point, the electronic logbook software actually contained a reconciliation option where tow estimates were reconciled to landed quantities. This option was removed since the fisherman is supposed to submit estimates on the vessel trip report. Another problem is that the fisherman can enter landed quantities then transfer these quantities to the tow. This may promote inaccurate estimates. We do not mean to promote this. However, there are cases where it may be necessary to enter data in this manner. However, entering data in this manner will make this program less useful to the fisherman. Maintaining accurate catch information by tow is an important benefit that the fisherman should utilize. It may be helpful to the fisherman to compare landed quantities to his estimates.

4.0 Data Definition

This software utilized Paradox tables within the Database Desktop for data management. This choice was somewhat arbitrary. As long as the following data definition is followed, almost any popular desktop database can be utilized with minimal programming effort. Enterprise database products could also be utilized if they follow the data definition described here. The programming effort to make this change would be a little more difficult but not all that extensive.

4.1 Trip Tables

The trip tables define the general information for each trip. The general trip record is a principal point of reference for the information required in the vessel trip report. It lists the date and time of departure as well as the port of departure. General information such as trip type, crew count, and angler count are kept here. There are also pointers to the vessel and the operator. The trip catch and trip discard tables store catch/discard totals for the entire trip. The trip landing table keeps a record of the landings for each trip. There is no limit to the number of landings. The trip costs table keeps track of the individual costs for each trip. Again, there is no limit to the number of cost items per trip.

tblTrip	<i>General record for each trip taken</i>
----------------	---

Field Name	Type	Size	Key / Index	Description
TripId	+		Primary Key	Counter for each trip taken
VesselId	Long		idxVessel	Pointer to vessel used for this trip
OperatorId	Long		idxOperator	Pointer to operator record
SailingId	Alpha	14		ACCSP trip identifier
DateSailed	Date			Date trip started
TimeSailed	Time			Time trip started
PortSailed	Alpha	30		Name of port from which trip started
StateSailed	Alpha	2		State in which trip started
EndDate	Date			End date of the trip
EndTime	Time			Time the trip ended
TripType	Short			Commercial, party, or charter trip?
CrewCount	Short			Number of crew members for this trip
AnglerCount	Short			Number of anglers for party/charter trip

Notes	Memo	16		User-entered notes for this trip
ReportType	Short			Aggregate or tow-based report
CheckDate	Date			Date of report check
TransDate	Date			Date of report file transfer
VerifyDate	Date			Date of report file verification

tblTripCatch	<i>Maintain amount of catch for each trip</i>			
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Field Name	Type	Size	Key / Index	Description
CatchId	+		Primary Key	Counter for each trip catch record
SpeciesCode	Alpha	5	idxSpecies	NMFS-supplied species code
Estimate	Num			Estimated amount of species caught during trip
DealerPermit	Alpha	6	idxDealer	Pointer to dealer who purchased items
DateSold	Date		idxDate	Date product sold
TripId	Int		idxTrip	Pointer to trip record

tblTripDiscard	<i>Maintain amount of discard for each trip</i>			
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Field Name	Type	Size	Key / Index	Description
DiscardId	+		Primary Key	Counter for each trip discard record
SpeciesCode	Alpha	5	idxSpecies	NMFS-supplied species code
DiscardQty	Num			Estimated amount of species discarded during trip
DiscardCode	Int		idxDiscard	Pointer to discard reason
TripId	Int		idxTrip	Pointer to trip record

tblTripLanding	<i>Maintain landing(s) for given trip</i>			
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Field Name	Type	Size	Key / Index	Description
LandingId	+		Primary Key	Counter for each landing
PortLanded	Alpha	30		Name of the landed port
StateLanded	Alpha	2		State where port is located
DateLanded	Date			Date landed
TimeLanded	Time			Time vessel landed
TripId	Long		idxTrip	Pointer to trip record

tblTripCosts	<i>Table keeping track of various costs associated with a trip</i>
---------------------	--

Field Name	Type	Size	Key / Index	Description
TripCostId	+		Primary Key	Identifier for trip cost record
CostDescr	Alpha	40		Text description of cost
TripCost	Num			Actual cost
TripId	Long		idxTrip	Pointer to trip record

4.2 Tow Tables

The Tow Tables allow the user to keep a record of each tow as well as catch and discard quantities for each tow. These quantities are the only values sent in the vessel trip report. There is also a mechanism that allows the user to record information at user-defined intervals within a tow (see the tow sample table). Integration with GPS and sensor systems make this a viable option, thereby allowing for better data collection. The user can attach a note to the entire tow as well as attaching notes to each interval. Tows are tied to both the trip and gear type tables through the TripId and GearId foreign keys respectively.

tblTow	<i>General record applied to each tow</i>
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Field Name	Type	Size	Key / Index	Description
TowId	+		Primary Key	Counter for each tow
TowSeq	Short		idxSeq	Indicator for tow's sequence in the trip
StartDate	Date			Date of tow beginning
EndDate	Date			Date of tow end
StartTime	Time			Time of tow beginning
EndTime	Time			Time of tow end
ChartArea	Alpha	3		Chart area in which tow took place
Location1	Alpha	10		Location where tow started
Location2	Alpha	10		Location where tow started
EndLoc1	Alpha	10		Location where tow ended
EndLoc2	Alpha	10		Location where tow ended
AvgDepth	Num			Average depth of net for the tow
AvgSpeed	Num			Average vessel speed during tow
GearQty	Short			Quantity of gear used during tow

HaulCount	Short			Total number of hauls for the tow
SoakHours	Short			Average soak time for each haul (hours value)
SoakMinutes	Short			Average soak time for each haul (minutes value)
Notes	Memo	16		User-entered notes about the tow
TripId	Int		idxTrip	Pointer to trip record
GearId	Int		idxGear	Pointer to gear used

tblTowSample	<i>Maintain data collected at specific tow intervals</i>			
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Field Name	Type	Size	Key / Index	Description
SampleId	+		Primary Key	Counter for each tow interval
Date	Date			Date of tow sample
Time	Time			Time of tow sample
Location1	Alpha	10		Latitude or station bearing #1 for tow sample
Location2	Alpha	10		Longitude or station bearing #2 for tow sample
Depth	Num			Depth of net at time of tow sample
Speed	Num			Vessel speed at time of tow sample
SurfaceTemp	Num			Surface temperature at time of tow sample
DepthTemp	Num			Temperature at depth of net at time of tow sample
Salinity	Num			Water salinity (in PPT) at time of tow sample
Conductivity	Alpha	3		Water conductivity at time of tow sample
TideHeight	Num			Height of tide at time of tow sample
EbbFlow	Alpha	1		Tide ebb (= 0) or flow (= 1) at time of tow sample
CurrentSpeed	Num			Velocity of current at time of tow sample
CurrentDir	Alpha	3		Direction of current at time of tow sample
Notes	Memo	16		User-entered notes about the tow sample
SetFlag	Log			Indicates tow set
UpFlag	Log			Indicates tow up
TripId	Int		idxTrip	Pointer to trip record
TowId	Int		idxTow	Pointer to tow record

tblTowCatch	<i>Maintain amount of catch for each tow</i>			
--------------------	--	--	--	--

Field Name	Type	Size	Key / Index	Description
CatchId	+		Primary Key	Counter for each tow catch record
SpeciesCode	Alpha	5	idxSpecies	NMFS-supplied species code
Estimate	Num			Estimated amount of species caught during tow

DealerPermit	Alpha	6	idxDealer	Pointer to dealer who purchased items
DateSold	Date		idxDate	Date product sold
TripId	Int		idxTrip	Pointer to trip record
TowId	Int		idxTow	Pointer to tow record

tblTowDiscard	<i>Maintain amount of discard for each tow</i>			
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Field Name	Type	Size	Key / Index	Description
DiscardId	+		Primary Key	Counter for each tow discard record
SpeciesCode	Alpha	5	idxSpecies	NMFS-supplied species code
DiscardQty	Num			Estimated amount of species discarded during tow
DiscardCode	Int		idxDiscard	Pointer to discard reason
TripId	Int		idxTrip	Pointer to trip record
TowId	Int		idxTow	Pointer to tow record

4.3 Operator and Crew Tables

The operator and crew tables are self explanatory. The operator table contains the information for all possible operators. The crew table contains the information for all possible crew members. Each table contains an index on the first and last names. This allows the records to be displayed in alphabetical order. Note the address pointer field in each record. This links these tables to the address book program.

tblOperator	<i>Table containing information pertinent to an operator</i>			
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Field Name	Type	Size	Key / Index	Description
OperatorId	+		Primary Key	Unique identifier for each operator
LastName	Alpha	20	idxName	Last name of the operator
FirstName	Alpha	20	idxName	First name of the operator
PermitId	Alpha	10		Operator's permit number
AddrPointer	Long		idxAddr	Pointer to operator's address

tblCrew	<i>Contains information for all potential crew members</i>			
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Field Name	Type	Size	Key / Index	Description
CrewId	+		Primary Key	Unique identifier for each crew member
LastName	Alpha	20	idxName	Last name of the crew member
FirstName	Alpha	20	idxName	First name of the crew member
PermitId	Alpha	10		Fishing permit for crew member
AddrPointer	Long		idxAddr	Pointer to crew member's address

4.4 Gear Tables

The Gear Tables are used to tie the gear fished, mesh/ring size, and gear size data items into a single entity. Once this information is entered, the user just has to select the resultant entity instead of supplying values for the three data items. Also, the system will automatically handle the creation of a new vessel trip report for each new gear fished or mesh/ring size used. The target species table allows the user to assign one or more target species to each gear type. The gear discard table allows the user to assign species that are typically discarded to the gear type. When the gear type is selected during a tow event, the typical catch and discard assigned to the gear are assigned to the tow catch with empty quantity records. In addition to describing the gear types, the gear tables allow the user to set up defaults for the tow at program inception. The following data items from the vessel trip report will be given default values at gear type setup:

Chart Area

Average Depth

Average Speed

Number of Hauls

Quantity of Gear

Average Tow / Soak Time

There is also a table, tblGearType, that maintains NMFS gear fished codes. The tblGearCat table allows for categorization of NMFS gear fished codes.

tblGear

Maintain record for each type of gear in possession

Field Name	Type	Size	Key / Index	Description
GearId	+		Primary Key	Counter for each variation of gear owned
GearDescr	Alpha	30	idxDescr	Allows user to enter descriptor for gear type
GearFished	Alpha	3		3-letter code for gear fished
MeshRing	Num			Maintains mesh or ring size value
GearSize	Num			Maintains gear size value
MeshType	Alpha	1		Square or Diamond mesh type indicator
DefChart	Alpha	3		Default chart area for this gear type
DefDepth	Num			Default average depth for this gear type
DefSpeed	Num			Default average speed for this gear type
DefHauls	Short			Default # of hauls for this gear type
DefGearQty	Short			Default quantity of gear for this gear type
DefSoakHours	Short			Default average soak hours for gear type
DefSoakMins	Short			Default avearge soak minutes for gear type

tblGearTarget	<i>Define target species for each gear type</i>
----------------------	---

Field Name	Type	Size	Key / Index	Description
GearTargetId	+		Primary Key	Unique identifier for each target species
SpeciesCode	Alpha	5	idxSpecies	NMFS species code
GearId	Long		idxGear	Pointer to gear table

tblGearDiscard	<i>Define typically discarded species for each gear type</i>
-----------------------	--

Field Name	Type	Size	Key / Index	Description
DiscardId	+		Primary Key	Unique identifier for each species discarded
SpeciesCode	Alpha	5	idxSpecies	NMFS species code
GearId	Long		idxGear	Pointer to gear table

tblGearType	<i>Store NMFS gear codes</i>
--------------------	------------------------------

Field Name	Type	Size	Key / Index	Description
GearCode	Alpha	3	Primary Key	NMFS gear code
GearDescr	Alpha	40	idxDescr	Description of gear
CategoryId	Long		idxCategory	Pointer to category

tblGearCat	<i>Allow for categorization of NMFS gear codes</i>
-------------------	--

Field Name	Type	Size	Key / Index	Description
CategoryId	+		Primary Key	Unique identifier for each gear category
CategoryDescr	Alpha	40	idxDescr	Description of each gear category

4.5 Species Tables

The species tables allow the user to maintain NMFS species codes. In addition, the tblSpeciesCat table allows for species code categorization. Quota limits can be defined for each species to indicate government imposed limits on particular species. The program will compare estimated catch totals against these limits and issue a warning as the limit is approached. The MaxEntry field is a ceiling for the quantity entry of the species. A warning will be issued each time a single estimate entry exceeds this value.

tblSpeciesType	<i>Store NMFS species codes</i>
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Field Name	Type	Size	Key / Index	Description
SpeciesCode	Alpha	5	Primary Key	NMFS species code
SpeciesDescr	Alpha	40	idxDescr	Description of species
MaxEntry	Num			Maximum quantity entry for this species
SpeciesLimit	Num			Quota limit for this species
CategoryId	Long		idxCategory	Pointer to category

tblSpeciesCat	<i>Allow for categorization of NMFS species codes</i>
----------------------	---

Field Name	Type	Size	Key / Index	Description
CategoryId	+		Primary Key	Unique identifier for each species category
CategoryDescr	Alpha	40	idxDescr	Description of each species category

4.6 Vessel Tables

The vessel tables describe the characteristics of a vessel. The system allows for as many vessels as the user wishes to enter. In addition to describing the vessel, the vessel tables allow the user to set up defaults for the system at program inception. The following data items from the vessel trip report will be given default values at vessel setup:

Vessel Name

USCG Doc or State Reg No

Vessel Permit No

Trip Type

No. of Crew

Gear Used

Chart Areas Fished

Landing Port and State

Operator Name and Permit Number

The tblEquMnt table allows the user to keep a record of maintenance to the vessel.

tblVessel	<i>Table describing characteristics of each vessel</i>
------------------	--

Field Name	Type	Size	Key / Index	Description
VesselId	+		Primary Key	Unique identifier for each vessel
VesselName	Alpha	30		Name of the vessel
PermitNo	Alpha	6		Permit # issued to vessel by NMFS
UscgDoc	Alpha	8		USCG-assigned identifier for this vessel
StateRegId	Alpha	10		State-assigned identifier for this vessel
RegState	Alpha	2		State of registration
OutOfStateId	Alpha	10		Other state-assigned identifier
OutOfState	Alpha	2		Other state of registration
DefOperator	Long			Pointer to operator file
DefGear	Long			Pointer to default gear type
DefTripType	Alpha	1		Default trip type for this vessel

DefCrewCnt	Int			Default number of crew members for this vessel
HomePort	Alpha	30		Name of home port for this vessel
HomeState	Alpha	2		Name of home state
Manufacturer	Alpha	40		Informational field for mfg name
CellPhone	Alpha	10		Cell phone number for this vessel
YearBuilt	Alpha	4		Year that the vessel built
Type	Alpha	30		Type of vessel
Class	Alpha	1		Classification for this vessel
HullType	Alpha	30		Hull type for this vessel
HoldCapacity	Num			Hold capacity for this vessel
VhfCallSign	Alpha	30		VHF call sign for this vessel
VesselPhone	Alpha	14		Phone number for reaching vessel
RegLength	Int			Length of the vessel
RegLenUom	Alpha	4		Unit of measure for length of vessel
OverLength	Int			Overall length of the vessel
RegLenUom	Alpha	4		Unit of measure for overall length of vessel
Width	Int			Width of the vessel
WidthUom	Alpha	4		Unit of measure for width of vessel
GrossTon	Int			Gross tonnage of the vessel
GrTonUom	Alpha	4		Unit of measure for gross tonnage
NetTon	Int			Net tonnage of the vessel
NetTonUom	Alpha	4		Unit of measure for net tonnage

tblEquMnt *Table keeping track of equipment maintenance*

Field Name	Type	Size	Key / Index	Description
MaintId	+		Primary Key	Identifier for maintenance record
DateMaint	Date			Date of equipment maintenance
MaintCost	Num	6.2		Cost of equipment maintenance
EquipId	Long		Foreign Key	Pointer to equipment record

4.7 Address Book Tables

The address book is a utility application designed to provide detailed address information on operators, crew members, suppliers, etc. It also serves as a centralized method of recording the same information across segregated components of the application. The category fields provide a mechanism for grouping address

records. For instance, categories might be created for crew members, operators, and suppliers. The user could then choose to display only suppliers.

tblNames	<i>Store the name of each crew member, operator, supplier, etc.</i>
-----------------	---

Field Name	Type	Size	Key / Index	Description
NameCode	+		Primary Key	Unique id for each address record
FirstName	Alpha	30		Individual's first name
LastName	Alpha	30		Individual's last name
Company	Alpha	30		Company name
Category	Long		Index	Pointer to category record

tblAddress	<i>Store the address for each entry</i>
-------------------	---

Field Name	Type	Size	Key / Index	Description
AddrCode	+		Primary Key	Unique id for each street address record
Address1	Alpha	30		First line of street address
Address2	Alpha	30		Second line of street address
City	Alpha	30		City
State	Alpha	2		State
Zip	Alpha	9		Postal code
NameCode	Long		Foreign Key	Pointer to name record

tblPhone	<i>Store phone numbers for each entry</i>
-----------------	---

Field Name	Type	Size	Key / Index	Description
PhoneCode	+		Primary Key	Unique id for each phone record
Description	Alpha	30		Text descriptor for phone record
PhoneNumber	Alpha	10		Actual phone number
Extension	Alpha	5		Phone extension
NameCode	Long		Foreign Key	Pointer to name record

tblEmail	<i>Store e-mail addresses for each entry</i>
-----------------	--

Field Name	Type	Size	Key / Index	Description
EmailCode	+		Primary Key	Unique id for each e-mail record
Description	Alpha	30		Text descriptor for e-mail record
Address	Alpha	30		E-mail address
Service	Alpha	15		E-mail service used
NameCode	Long		Foreign Key	Pointer to name record

tblMemo	<i>Mechanism to attach a note to each address</i>
----------------	---

Field Name	Type	Size	Key / Index	Description
MemoCode	+		Primary Key	Unique id for each memo
Description	Alpha	30		Text descriptor for memo
MemoData	Memo	32		Actual memo text (pointer to a file)
NameCode	Long		Foreign Key	Pointer to name record

tblCats	<i>Mechanism to group related address records together</i>
----------------	--

Field Name	Type	Size	Key / Index	Description
CatsCode	+		Primary Key	Unique id for each category
Description	Alpha	30		Text descriptor for each category

4.8 Calendar Table

The calendar is a utility application designed to make it easier to implement dated entries (i.e. trip start and end dates). It can also be used as a general-purpose personal planner.

tblCalendar	<i>Maintain entries into calendar</i>
--------------------	---------------------------------------

Field Name	Type	Size	Key / Index	Description
CalCode	+		Primary Key	Unique id for each entry into calendar
Date	Date			Date of calendar entry
Text	Alpha	50		Text for calendar entry
StartTime	Time			Start time for action

EndTime	Time			End time for action
EntryType	Alpha	2		Type of entry (i.e. trip start/end, miscellaneous)

4.9 Transmission Tables

The transmission tables keep track of record transfer between the fisherman, the dealer/processor, and the appropriate government agency. The transmission system will guarantee that all appropriate file transfers take place. There are tables to maintain records of trip transfer, fish ticket transfer, and trip verification. These tables will be better defined as file transfer mechanisms are established.

tblTripTrans	<i>Maintain record of trip report transmissions</i>			
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Field Name	Type	Size	Key / Index	Description
TransId	+		Primary Key	Unique identifier for each transmission
TripId	Long		Foreign Key	Pointer to trip record
DateSent	Date			Date transmission sent
RecCount	Int			Number of records transferred

tblTicketTrans	<i>Maintain record of fish ticket transfers in</i>			
-----------------------	--	--	--	--

Field Name	Type	Size	Key / Index	Description
TransId	+		Primary Key	Unique identifier for each tranfer in
TicketId	Long		Foreign Key	Pointer to fish ticket record
DateRecvd	Date			Date fish ticket transmission received
RecCount	Int			Number of records transferred

tblTripVerify	<i>Verification record for trip report transmission</i>			
----------------------	---	--	--	--

Field Name	Type	Size	Key / Index	Description
VerifyId	+		Primary Key	Unique identifier for verification record
TransId	Long		Foreign Key	Pointer to trip report transmission record
DateRecvd	Date			Date transmission received

RecCount	Int			Number of records transferred
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4.10 Fish Ticket Tables

The fish ticket tables maintain a record of each sales transaction. The system will use this information to reconcile estimated catch with actual amount sold (or used for personal consumption, seized for violations, etc.). The fish ticket tables consist of a table describing the fish ticket header and a table that describes each item on the fish ticket. Fish tickets are related to the trip via the TripId data field. There are also tables for the dealer and dealer product. The dealer table maintains general information about the dealer. The dealer product table lists each item the dealer accepts. It maintains the SpeciesCode data item that performs the association with the NMFS species codes as entered in the tow catch section. The connection between the fish ticket item and the dealer product is accomplished with the ProductCode data item.

tblFishTicket	<i>Maintain record of each sales transaction</i>
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Field Name	Type	Size	Key / Index	Description
TicketId	Alpha	6	Primary Key	Unique id for each sales transaction
DealerPermit	Alpha	8	Primary Key	NMFS dealer permit number
TicketDate	Date		idxDate	Date of fish ticket transaction
DealerRep	Alpha	30		Name of dealer rep for this transaction
TripId	Long		idxTrip	Pointer to trip record

tblTicketItems	<i>Record for each item in sales transaction</i>
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Field Name	Type	Size	Key / Index	Description
DealerPermit	Alpha	8	Primary Key	NMFS dealer permit number
TicketId	Alpha	6	Primary Key	Unique id for each sales transaction
ProductCode	Alpha	8	Primary Key	Dealer product identifier
ProductDescr	Alpha	30		Dealer product description
SpeciesCode	Alpha	5	idxSpecies	NMFS species code
LandedQty	Num			Amount of product sold
Uom	Alpha	3		Unit of measure for product sold
UnitPrice	\$			Price per unit of product

TripId	Long		idxTrip	Pointer to trip record
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tblDealer	<i>Maintain dealer information</i>			
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Field Name	Type	Size	Key / Index	Description
DealerPermit	Alpha	8	Primary Key	NMFS dealer permit number
DealerName	Alpha	30	idxName	Descriptor for dealer
Address1	Alpha	30		First line of dealer's address
Address2	Alpha	30		Second line of dealer's address
City	Alpha	20		City where dealer is located
State	Alpha	2		State where dealer is located
Zip	Alpha	10		Dealer's zip code
Phone	Alpha	14		Dealer's phone number

tblDealerProduct	<i>Dealer view for each item</i>			
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Field Name	Type	Size	Key / Index	Description
DealerPermit	Alpha	8	Primary Key	NMFS dealer permit number
ProductCode	Alpha	8	Primary Key	Dealer product identifier
ProductDescr	Alpha	30		Dealer product description
SpeciesCode	Alpha	5		NMFS species code

4.11 Management Area Tables

The management area tables maintain a record of each management area and its associated boundaries. The objective was to eliminate errors in tow location entry. The location entries are checked for enclosure within the boundaries for the chart area entry. This will eradicate significant location entry errors and ensure, at the very least, that the values entered for the locations will correspond to the value entered for chart area.

tblMgmtArea	<i>Maintain table of NMFS chart areas</i>			
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Field Name	Type	Size	Key / Index	Description
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AreaId	Alpha	3	Primary Key	NMFS chart area
AreaDescr	Alpha	30		Descriptor of chart area

tblBoundary	<i>Maintain record of boundary points for each chart area</i>			
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Field Name	Type	Size	Key / Index	Description
BoundaryId	+		Primary Key	Unique identifier for boundary record
Point1	Alpha	10		Location of first boundary point
Point2	Alpha	10		Location of second boundary point
AreaId	Alpha	3	idxArea	Pointer to chart area

4.12 User Table

The user table maintains each user of the system and their associated application privileges. Each user is capable of entering only those modules of the application for which they have access privileges. This allows for multiple users of the system while restricting access to vital or sensitive areas.

tblUsers	<i>Maintain table of users of the system and their privileges</i>			
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Field Name	Type	Size	Key / Index	Description
UserName	Alpha	20	Primary Key	Login name of the user
Password	Alpha	20		Password for the user
MgrFlag	Log			General logbook manager privileges indicator
SecFlag	Log			User security privilege indicator
BackRestFlag	Log			Backup / Restore privilege indicator
ImpExpFlag	Log			Import / Export privilege indicator
ArchRetrFlag	Log			Archive / Retrieval privilege indicator
OperCrewFlag	Log			Operator / Crew entry privilege indicator
VesselFlag	Log			Vessel entry privilege indicator
GearFlag	Log			Gear type definition privilege indicator
DealerFlag	Log			Dealer entry privilege indicator
SpeciesFlag	Log			Specied code maintenance privilege indicator
MgmtAreaFlag	Log			Management area maintenance privilege indicator
PermitFlag	Log			Permit management privilege indicator

LimitsFlag	Log			Entry limit privilege indicator
TripFlag	Log			Trip entry privilege indicator
TowFlag	Log			Tow entry privilege indicator
CatchFlag	Log			Catch entry privilege indicator
FishTixFlag	Log			Fish ticket entry privilege indicator
TripReportFlag	Log			Ability to issue trip reports indicator

5.0 File Transmission Specification

The following charts describe the preliminary specification for direct file transmission. The result is a comma-delimited ASCII file, also known as ASCII-2, that can be transferred with any method typically used to transfer files (floppy disk, phone line, e-mail, etc.). This file has been successfully read in by the Study Fleet Program.

The file contains several different record types. There are header and trailer record types which serve to verify that the file was sent in its entirety. There will be one of each type per trip. The trip record type contains information pertaining to the trip and tow. There is one trip record for each tow. There are record types for catch and discard records. Note that catch and discard records are separate entities. There can be any number of catch and/or discard records for each tow (including zero). Finally, there is the landing record type which describes each landing. There can be one or more landing records for each tow. The final three fields of the trip record contain counters for the catch, discard, and landing record types.

Field layout for header record type

Pos	Reference Name	Description of Field	Type & Max. Length
1	Data Source Name	The name of the data source (“UNH Logbook”)	Char (20)
2	Software Version	The version of the software	Char (6)
3	Date Created	The date the data file was created	Date

Field layout for trip record type

Pos	Reference Name	Description of Field	Type & Max. Length
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1	Record Type	Indicator for the type of trip report record. For the trip record, this value is always 0.	Char (1)
2	Trip Report Identifier	Unique identifier for trip report. This field is generated by taking the vessel permit #, Uscg doc. #, or the state reg. # field (in order of priority) and appending a program-generated counter.	Char (16)
3	Identifier Type	Value is 0 if vessel permit #, 1 if Uscg doc. #, or 2 if state registration # used in trip report identifier	Char (1)
4	Vessel Name	The name of the fisherman's vessel	Char (30)
5	Uscg Doc. #	Official coast guard documentation # for the vessel	Char (8)
6	State Reg. #	State registration # for the vessel	Char (10)
7	Vessel Permit #	NMFS-issued permit # for the vessel	Char (6)
8	Date Sailed	Date trip began	Date
9	Time Sailed	Time trip began	Time
10	Trip Type	0 – commercial trip type, 1 – party trip, 2 – charter	Char (1)
11	# of Crew	The total number of crew members on trip.	Short Integer
12	# of Anglers	Total # of anglers for party/charter trip, excluding the vessel's crew.	Short Integer
13	Gear Fished	NMFS-supplied code for gear fished.	Char (3)
14	Mesh/Ring Size	Mesh or ring size for gear fished (in inches)	Numeric
15	Quantity of Gear	Quantity of gear used per haul	Integer
16	Size of Gear	Size of gear being used	Numeric
17	Mesh Type	Type of mesh for the gear fished (“SQUARE”, “DIAMOND” or “ ”)	Char (7)
18	Tow Start Date	Starting date for the tow	Date
19	Tow End Date	Date tow ended	Date
20	Tow Start Time	Starting time for the tow	Time
21	Tow End Time	Time tow ended	Time
22	Chart Area	NMFS-supplied code for area fished	Char (3)
23	Start Location1	Latitude or station bearing #1 at tow start	Char (10)
24	Start Location2	Longitude or station bearing #2 at tow start	Char (10)
25	End Location1	Latitude or station bearing #1 at tow completion	Char (10)
26	End Location2	Longitude or station bearing #2 at tow completion	Char (10)
27	Average Depth	Average depth fished (in fathoms)	Numeric
28	Average Speed	Average speed during tow (in knots)	Numeric
29	# of Hauls	Times gear hauled, lifted, or thrown	Short Integer
30	Avg Tow/Soak Hours	Estimated amount of time spent fishing (hour value)	Short Integer
31	Avg Tow/Soak Minutes	Estimated amount of time spent fishing (minutes value)	Short Integer

32	Operator's Last Name	Last name of operator submitting report	Char (20)
33	Operator's First Name	First name of operator submitting report	Char (20)
34	Operator Permit	NMFS-issued operator permit #	Char (8)
35	Date of Report	Date report record created	Date
36	Catch Record Count	# of species catch records	Short Integer
37	Discard Record Count	# of species discard records	Short Integer
38	Landing Record Count	# of vessel landing records	Short Integer

Field layout for catch record type

Pos	Reference Name	Description of Field	Type & Max. Length
1	Record Type	Indicator for the type of trip report record. For the catch record, this value is always 1.	Char (1)
2	Trip Report Identifier	Unique identifier for trip report. This field is generated by taking the vessel permit #, Uscg doc. #, or the state reg. # field (in order of priority) and appending a program-generated counter.	Char (16)
3	Identifier Type	Value is 0 if vessel permit #, 1 if Uscg doc. #, or 2 if state registration # used in trip report identifier	Char (1)
4	Species Code	NMFS-supplied species code identifying species caught	Char (5)
5	Amount Kept	Amount of species kept (pounds for commercial, count for party / charter)	Numeric
6	Dealer Permit #	NMFS-issued dealer permit # for dealer purchasing catch	Char (6)
7	Dealer Name	Name of dealer purchasing catch	Char (30)
8	Date Sold	Date of sale for this species	Date

Field layout for discard record type

Pos	Reference Name	Description of Field	Type & Max. Length
1	Record Type	Indicator for the type of trip report record. For the discard record, this value is always 2.	Char (1)
2	Trip Report Identifier	Unique identifier for trip report. This field is generated by taking the vessel permit #, Uscg doc. #, or the state reg. # field (in order of priority) and appending a program-generated counter.	Char (16)
3	Identifier Type	Value is 0 if vessel permit #, 1 if Uscg doc. #, or 2 if	Char (1)

		state registration # used in trip report identifier	
4	Species Code	NMFS-supplied species code identifying species discarded	Char (5)
5	Amount Discard	Amount of species discarded (count for party / charter, pounds for commercial)	Numeric

Field layout for landing record type

Pos	Reference Name	Description of Field	Type & Max. Length
1	Record Type	Indicator for the type of trip report record. For the landing record, this value is always 3.	Char (1)
2	Trip Report Identifier	Unique identifier for trip report. This field is generated by taking the vessel permit #, Uscg doc. #, or the state reg. # field (in order of priority) and appending a program-generated counter.	Char (16)
3	Identifier Type	Value is 0 if vessel permit #, 1 if Uscg doc. #, or 2 if state registration # used in trip report identifier	Char (1)
4	Port Landed	Name of port where landing occurred or where trip was completed	Char (30)
5	State Landed	Abbreviation of state where landing took place	Char (2)
6	Date Landed	Date of landing	Date
7	Time Landed	Time of landing	Time

Field layout for trailer record type

Pos	Reference Name	Description of Field	Type & Max. Length
1	Data Source Name	The name of the data source (“UNH Logbook”)	Char (20)
2	Software Version	The version of the software	Char (6)
3	Date Created	The date the data file was created	Date
4	Number of Records	The number of records in the file including Header and Trailer records	Integer

6.0 What’s Left?

Software is never complete. There are always changes and additions that can be made in order to improve the product. Up to this point, the focus has been on ensuring that the software provides an easy method of fulfilling government reporting requirements. As the software gets more use and the focus shifts to value-added capability, many of these changes and additions will become apparent. This section will concentrate on those tasks that would make this package deliverable. By deliverable, I mean a package that could be shrink-wrapped and sold at retail (although that is not the intent). The main areas of improvement are report features, data translation, online help, and adding communications between the software and fishing hardware (i.e. GPS, thermal sensors). In general, these tasks are just finishing touches that are not difficult to implement.

6.1 Logbook Reports

The overall reporting capability must be improved. Too much time was spent on the report viewer and not enough time on the reports themselves. Several of the more obvious reports have been created. However, in some cases, these reports are merely skeletal and their presentation should be dramatically improved. Also, in a deliverable product, there must be a mechanism for the user to customize reports. This would give the user the flexibility required by basically allowing for the creation of any report.

6.2 Data Translation

Data translation has to be tested and improved. One example that would be helpful is in the incorporation of management area boundaries. It would be helpful if these boundaries could be made available for the fisherman to download into the system. For those who do not want to implement a GPS interface, this would reduce the number of errors in entering location values dramatically. Another improvement could be in the exchange of fish ticket information with dealers. Right now, the fisherman must key enter the landed quantities and sell prices. For a deliverable product, it is important to have a general-purpose exchange facility. Right now, data translators are one-to-one solutions that only work between two cooperating systems. A general-purpose facility would provide a method of exchange between many software systems.

6.3 Develop Online Help Facility

An online help facility is required. There is a user's guide available (admittedly it is somewhat shoddy since people do not read user's guides). However, it is more important to have online help. This provides the user with context-sensitive help for areas that need more explanation.

6.4 Support for Additional Fishing Devices

There will be a continuing effort to incorporate additional fishing hardware (GPS, Temperature Loggers, etc.) into the electronic logbook. The Study Fleet Project from Perot Systems has incorporated the electronic logbook software into their suite of tools and devices. The Study Fleet Project is also supplying the funding and expertise in integrating the various hardware as well as software tools into an effective system.

7.0 Next Steps

There is very little doubt from the perspective of this project that replacing the paper-based logbook reporting system currently utilized with an electronic logbook reporting system would be a popular decision within the fishing community. However, there are several, potentially extensive, tasks yet to be accomplished before this can take place. A unique trip identifier must be defined and standardized, an infrastructure for electronic communication must be established between fishermen, regulatory agencies, as well as dealers, and a support mechanism must be set in place to handle future change and improvements.

The fishermen who tested the software gave it a very favorable response. It reduces the effort of submitting vessel trip reports and provides some benefit in managing fishing activity. So why not make the program available for widespread distribution right now? Unfortunately, a drawback to this project is that it does not deliver an autonomous system. Complementary computational and logistical tasks must be completed in order to provide a suitable support environment for electronically transferring trip information. Without a mechanism to electronically transmit the trip data, the software package developed under this project provides only marginal benefit to the user. It is only after this environment is established that maximum benefit can be attained. An overview of each task required, as viewed by this project, follows below.

7.1 Define and standardize a unique trip identifier

A primary goal of this project was to reduce the fisherman's as well as the regulatory agencies' effort in acquiring accurate catch and discard data. Computerized entry, effective merging and checking routines, and setting up communication links are major efforts in this area. To create an effective environment for data transfer and cross-reference, a unique identifier must be attached to each trip that can serve as a link among the various entities involved in capturing catch information.

The best example of the use of a unique trip identifier would be in the reconciliation of estimated catch quantities submitted by the fisherman with the landed quantities submitted by the dealer. The current method of entry almost begs the fisherman to enter quantities at the end of the trip (or at the end of the month) since the dealer information is entered on the vessel trip report. With a unique trip identifier, the fisherman could submit true estimates by tow and the dealer could submit a fish ticket incorporating the trip identifier. These values could then be easily corroborated by linking through the trip identifier.

Another example would be in the submission of multiple VTR's for a trip. Accuracy can be increased if tow-based information is submitted. Especially for longer trips who may move around quite a bit. The trip identifier could be utilized to tie the tow information together.

A problem in utilizing a unique trip identifier may be in accurately typing it in. This identifier should include the source of the information (perhaps a vessel identifier or operator permit number) as well as a specification for the trip (start date?). This, however, does not guarantee a unique trip since the fisherman may take more than one trip in a day. This probably necessitates the addition of a counter appended to the identifier for each trip. This would result in a relatively lengthy data entry field which would be subject to error. This software package could be made to check such a value against those fields or automatically extract the fields from this value thereby saving typing.

7.2 Establish an infrastructure for electronic communication between fishermen, regulatory agencies, and dealers

The software developed in this project represents one possible method of improving data acquisition. Other methods are available or will soon become available. An environment must be set up that can retrieve info from

a variety of sources. This requires the appropriate computing/networking hardware, the proper database and communication software, and, most importantly, an effective methodology.

When most people think of developing an infrastructure for electronic communication, they think in terms of the networking hardware and software. Obviously, having the hardware and software in place is important but establishing an effective methodology is what will make the system successful. The main questions to be answered here are:

- How does the user know the report was received?
- How does the user know if the report was accepted or rejected?
- What errors were found?
- How are errors corrected?

Basically, the data transfer process should be a managed activity. A record of when the transfer occurred must be maintained and feedback must be given to the fishermen regarding the accuracy of the data transferred.

The file format for the data transfer of information representative of that found in the vessel trip report must be standardized. This project has created import and export routines that allow the fishermen to choose data fields to send or receive (with the key field) and places them into a comma-delimited format (known as ASCII-2) or a fixed field position format. The result is just a data file that can be transferred utilizing any method typically used to transmit files (floppy disk, phone line, e-mail, etc.). This is not a terribly robust method. However, the resulting file can be placed anywhere that the user desires within the computer system (hard drive, floppy drive, network drive, etc.), can be transferred via any protocol over any device, and is extremely easy to import or export. However, the other end of the transfer must have the capability of generating and receiving the file in this format. XML is the current method of choice for transferring documents. XML along with a document type definition (DTD) results in a self-describing document. The document is relatively simple, yet, it is robust. Almost anything can be placed in the document. The format would be independent of any communications protocol meaning it could be transferred via any method. However, creating XML files is more difficult than creating ASCII-2 files. This application may not warrant the added complexity.

Once the file format is defined, the physical communication path must be determined. There are many possibilities for this. File downloads to a website or the use of e-mail with attachments can be easily programmed into the electronic logbook software. Basically, the software creates data files that should be

independent of transfer protocol and hardware. The question to be answered is what is the level of effort required for development and implementation at the point of receipt.

7.3 Determine the resource for support of the software

Even though the task of supporting this software would not be extensive, this system is not perfect and some support is required. Additional features might be requested. Government requirements may change. Users may need help with problems they stumble upon. From a technical viewpoint, the system would not be difficult to maintain. The problem is in generating revenue to offset support costs.

Can the system be supported by NMFS? This would probably be seen as an act of goodwill from the viewpoint of the fisherman so this may be a positive solution. However, there are some issues. Any time a change or upgrade takes place, there is a problem in supporting the existing system while making the transition to the new system. In the case of logbooks, the problem is amplified because a paperless system with a large number of users would be replaced with an electronic system. Does everyone go to the electronic system? How is that accomplished? Do the regulatory agencies support both, the paper-based as well as the electronic, systems? Can effort saved in replacing the current paper-based system be redirected towards supporting the paperless system? These questions, and probably many more, must be answered before this project's software can be implemented.

Selling the system as a commercial product is one method of generating income for support. However, there are many concerns with this. The system's primary benefit to the fisherman is that it provides an easier method for submitting vessel trip reports. Even though there is precedent for selling products to aid in fulfilling government requirements, this would not be beneficial given the current climate surrounding the industry. The product is a utility-level application that is useful but not essential. Utilizing the software provides some value-added benefit. However, its use does not provide a significant reduction in the cost of doing business for the fisherman. This makes it difficult to justify pricing the product in a manner that makes up for the relatively limited user base.

Including this product as a supported piece of a larger, integrated system is one way of addressing these concerns. This would be akin to the notepad, paint, and calculator programs within the Windows operating

system. These applications provide some value-added utility. However, they are rarely employed in a manner that reduces an operation's expenditures. This makes it difficult to justify the commercial purchase of these applications. In order to reach a large user base, they are packaged and supported as part of the operating system. In the case of the electronic logbook software, it might be best if the product is incorporated into another commercially available system such as plotting software/hardware. As communications between the various components of the fishing industry becomes more sophisticated, there is also the possibility that value added resellers or system integrators could emerge. They would perform the task of outfitting each vessel with the appropriate software and hardware. This could provide an umbrella under which the electronic logbook software could be supported.

8.0 Conclusion

With minimal effort, the software created within this project provides an effective, low cost solution to replacing the paper-based logbooks with an electronic alternative. It provides a rich feature set, is geared toward minimizing the amount of user input required, performs preliminary error-checking, and is not difficult to use. The application environment under which this software runs is made up of hardware and software that is relatively inexpensive, is easy to obtain, and enjoys widespread deployment. The most important advantage of this product is that the fisherman has complete control over its operation. The decisions of when to back up the data, who can access the data, what hardware to use, etc. are entirely up to the fisherman.

The big question is: will the fishermen use this, or similar, software? Events in the industry over the past year and a half have made this a difficult question to answer. During the formative phase of the project, fishermen had more important issues to deal with. The last thing the fishermen wanted to do was learn a new piece of software, especially in relation to logbook reporting. The fact that the original target user for this project was the smaller-scale fisherman was an additional complication since they may feel the impact of industry decisions more than others. This reluctance may be changing, as towards the end of the project more favorable responses were being received. With all this said, the main contention seems to be in the submission of the information itself not in utilizing computer-based tools to maintain the information. There is very little doubt from the perspective of this project that replacing the paper-based logbook reporting system currently utilized with some form of an electronic logbook reporting system would be a decision that would be second in popularity only to that of eliminating the submission of the vessel trip report altogether.

For those fishermen who did test the software, the biggest revelation was how easily they adapted to the product. It was not unusual for them to be operational within 15 minutes of use. This is probably due to the fact that the fishermen know all facets of their trade very well. It is not unusual for key entry personnel to be able to navigate around an operating system fairly well but not be able to navigate around a piece of software. This is often because their expertise is in data entry, not in understanding the underlying tasks for which the entry is performed. The fishermen, on the other hand, were not as adept in key entry but they knew all phases of the task at hand very well. Mapping program options to fishing tasks, limiting the amount of key entry required, and staying away from the nuances of window management allowed the fishermen to easily understand and navigate the software. As the fishermen learn the fundamentals of moving around within the computer environment, the software becomes extremely simple for them to use.

Other alternatives would have advantages over the electronic logbook software. Simply placing the vessel trip report form on the internet and allowing the user to enter values for each field would be the best solution for many, especially if the burden of retaining the information (i.e. paperwork) is lifted from the user. The need for data transfer would be eliminated since data entry would be directly linked to the database containing the trip report information. Training on the part of the fisherman would be minimal since the only significant change in the current method of filling out trip reports would be that typing replaces writing. Although, the electronic logbook software is not difficult to use, there is a certain sequence that must be followed and some initial setup is required. For example, the operators must be defined before trips can be created. Placing the form on the internet does not provide any value-added utility for the fisherman. That is not to say that it is impossible to add features to a web-based application that make it function like this project's software. However, with the added complexity, the advantage the web-based application had in training is nullified.

Opinions will always differ as to what is the best solution. In the end, the question of what is **the** best solution should be irrelevant. The best solution is always to offer the end user community as many viable alternatives as possible. In other words, a whole array of best solutions is the best solution. The intent, and end result, of this project was to provide one of these best solutions. Or, put another way, this project provides a viable option that is the best alternative for some of those in the fishing community.